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JOURNAL OF THE EAST AFRICA NATURAL HISTORY SOCIETY

VOL. XXIII No. 5 (102)

JANUARY 1960

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THE HYRACOIDEA

A Review of the Systematic Position and Biology of the Hyrax

By J. B. SALE, B.Sc., M.I.Biol.

Biology Department, Royal Technical College of East Africa

Probably the earliest reference to the Hyrax is that found in the Bible¹ where it is referred to several times by the name 'coney'. Today the Rock Hyrax is still found in parts of the Middle East and three genera occur in Africa. Two of these, *Procavia* and *Heterohyrax*, are the well known 'rock rabbits', which live in the shelter of rocky outcrops in many parts of East Africa. The third genus is *Dendrohyrax*, which is the arboreal form living in forests and famous for its loud call at night.

One interesting feature of the Hyrax is its relationship to other groups of animals. Earlier ideas emphasised affinities with the Perissodactyls (horse, rhinoceros) based on the lack of canines and the nature of the molars. This view is well expressed in Cuvier's Animal Kingdom²: "they are little less than rhinoceroses in miniature." The modern tendency is to relate the Hyrax to the elephant. The grouping together of these two widely differing animals is based on the fact that the fossil Hyrax of the Eocene period have a number of characteristics in common with the ancestors of the modern elephant. Arising from the same group, very early in the Palaeocene, are the Sirenia, or sea cows, of which the Dugong is an example found on East African coasts. Together with their fossil ancestors, the Hyrax, elephants and sea cows are included by most modern taxonomists in the Paenungulata³ or 'near-ungulates'. Primitive ungulate features shown by the group include several digits with poorly developed hoofs; incisors and canines reduced to single pairs of large tusks and molars specialised for grinding with the development of cross-ridges. The failure of the testes to descend into a scrotum in all living Paenungulates is a curious feature which seems to lack an adequate functional explanation. We may summarise the classification of living Paenungulates as follows:—

CLASS: MAMMALIA

Superorder: Paenungulata

Order 1. Hyracoidea	Family: Procaviidae Genus 1. <i>Procavia</i> 2. <i>Heterohyrax</i> 3. <i>Dendrohyrax</i>
Order 2. Proboscidea	Family: Elephantidae Genus 1. <i>Loxodonta</i> — African Elephant 2. <i>Elephas</i> — Indian Elephant
Order 3. Sirenia	Family: 1. Trichechidae Genus: <i>Trichechus</i> — manatee of Atlantic Ocean Family: 2. Dugongidae Genus: <i>Dugong</i> Family 3. Rhytinae Genus: <i>Rhytina</i>

¹ Lev. 11.5; Ps. 104.18; Prov. 30.26.

² The Animal Kingdom. Cuvier 1884, pp. 120.

³ Simpson, G. G. 1945. The Principles of Classification and a Classification of the Mammals. *Bull. Amer. Mus. Nat. Hist.* 85.

The first two genera of the Hyracoidea, *Procavia* and *Heterohyrax*, have much in common. Not only are their habits almost identical, but they show very few anatomical differences on which to base a division into separate genera. The main distinguishing features may be listed thus:

Feature	<i>Procavia</i>	<i>Heterohyrax</i>
(a) Hairs surrounding dorsal glandular spot	black	white or chestnut
(b) Molar teeth	broad	tend to be narrower than <i>Procavia</i>
(c) Upper incisors	very strong; close together	weaker than <i>Procavia</i> ; wider apart

In addition, there are slight differences in the measurements of some features of the skull. Apart from the colour of the hairs of the dorsal glandular spot, it is very difficult to state to which genus a given specimen belongs unless one has an identified specimen for comparison. The question as to whether two separate genera are justified seems to arise. Some idea of the confusion is gained when one notes that Allen (1939)⁴ places *Heterohyrax welwitschii* as a subspecies of *Procavia capensis*. Some authorities regard *Heterohyrax* as a sub-genus of *Procavia*⁵. There are some other cases of confusion in the naming of subspecies and a thorough revision of these two genera appears to be necessary.

The Tree Hyrax (*Dendrohyrax*) is readily distinguishable from the Rock Hyraxes both by its arboreal and nocturnal habits and on anatomical grounds. The long soft hair is quite different from the shorter hair of the other two genera. The muzzle is longer and the teeth show considerable differences. For instance, the outer pair of lower incisors retain the tricuspid condition in the adult, whilst this is lost in the adults of *Procavia* and *Heterohyrax*.

The habits of the Rock Hyraxes are better known than are those of their nocturnal relative, the Tree Hyrax. The rocky shelters where these animals live in colonies of fifty or more are often located in dry arid areas. A colony in the Sahara was noted by an explorer in an area which was completely waterless⁶. The urine is often viscous and the kidney must remove a large amount of the water from it, thus conserving water in the body. The habit of urinating and defaecating in the same spot is characteristic of the Rock Hyrax. A study of the occurrence of this habit in the animal kingdom does not seem to provide a ready explanation of its usefulness. The white rhinoceros is another noted example of an animal which has a communal dung heap. Feeding generally takes place during the daytime, the early morning and late afternoon being times of maximum activity outside the rocky holes in which the night and much of the middle of the day are spent.

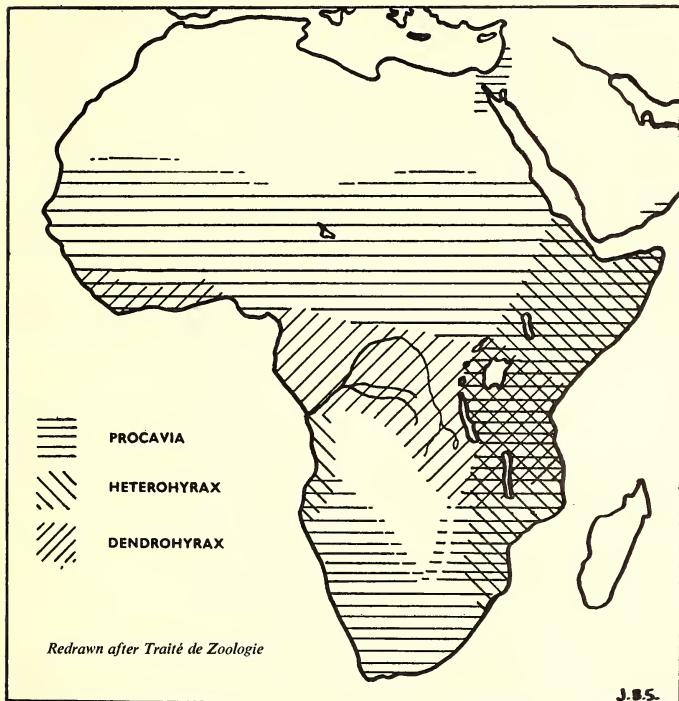
The Hyrax is, of course, a herbivore and the diet includes leaves, fruits and many varieties of grasses. Also lichens have been reported as food, particularly in areas where, due to lack of rainfall, other forms of vegetation are scarce. In fact it appears that at such times Hyrax will eat almost any vegetable material available, and extremely

⁴ Allen 1939. Checklist of African Mammals. *Bull. Mus. Comp. Zool.* LXXXIII.

⁵ See for instance Animaux Protégés au Congo Belge. 1953. Institut des Parcs Nationaux du Congo Belge, pp. 66.

⁶ *Traité de Zoologie*. Tome XVII, pp. 892.

GEOGRAPHICAL DISTRIBUTION OF GENERA IN AFRICA



dry and unappetising stalks and grasses can be found among the stomach contents.

The sight of the Hyrax is keen in spite of the fact that it spends much of its time in complete darkness and vision of objects as much as a mile away has been reported. When lying out in the sun, as they often do during the middle of the day, they have the habit of gazing up directly at the sun. This has led to the belief among some African tribes that the Hyrax are blind. It is reported⁷ that the eye of the Hyrax differs in structure from that of other animals.

Hearing, like sight, is probably quite keen and a general alertness is supplemented by a distinctive warning cry on the approach of an enemy. At such time one can see members of the colony hurrying back to their holes, negotiating the steep faces of rocks with superb agility. The thick flat soles of the feet, which are clammy in life, are well adapted to this mode of life, although they do not possess any real suctional power. Some observers state that the Hyrax breeds once a year but whether there is a definite breeding season is not clear. Two or three young are born per litter and the gestation period is said to be seven and a half months.

Little has been recorded of social life within the Hyrax colony. Gregarious animals living in a colony of this kind always have a fairly intricate social structure. The older males are said to remain on guard outside the entrances as 'sentinels' and some claim that adult members train up the juveniles in the ways of the colony. No real evidence seems available to support this, however. Fighting, probably between males, is sometimes noticed but whether this has any definite social significance is not known.

The mode of life of the Tree Hyrax is very different from that of the Rock Hyraxes. They are solitary animals, hiding in hollows and in the branches of trees during the day and becoming very active at night when they descend to the ground in search of food. The cry is of much greater volume than that of the other hyraxes and is a nuisance to the would-be sleeper in some forest areas. Only one or two young are born at a time.

The Hyracoidea have received very little attention either from the naturalist or from the serious scientific research worker. The literature on this group of animals is probably more slender than that of any other mammalian order. There are many problems, such as the nature of the social structure of the Hyrax colony, remaining to be investigated. Indeed, all aspects of the biology of these animals should provide a rewarding field of research.

A Snake's Meal

During a recent field course we were brought a mature specimen of the common house snake (*Boaedon fuliginosus fuliginosus*. Boie.). On examining the specimen to ascertain the cause of death, we found that a rat that had recently been consumed by the snake, had eaten its way through the oesophagus and the lateral body wall. Both animals had been found dead as a result.

Malcolm J. Coe

⁷ Austin Roberts. The Mammals of South Africa, 1951, pp. 252.

THE WATER-COBRA OF LAKE TANGANYIKA

By ARTHUR LOVERIDGE

Though more than 70 years have elapsed since Dollo described the eastern aquatic cobra (*Boulengerina annulata stormsi*), of its habits relatively little has been recorded.

So far as authentic records go, its sole habitat is Lake Tanganyika. There, at Kigoma and Karema on its eastern shore, Mr. C. J. P. Ionides secured eight in 1956, all of them being captured alive. Of these eight the three juveniles taken at Karema were subsequently killed, made into spirit specimens and sent to the M.C.Z., Cambridge, Massachusetts, U.S.A. More recently—in August, 1958—Ionides visited Mpulungu on the Northern Rhodesia coast at the south end of the Lake, where, in less than a fortnight, he captured another 25. With characteristic generosity Mr. Ionides has placed at my disposal the observations that he made during the course of these undertakings. They add so much to our knowledge that it seems to me they should, by publication, be made available to a wider circle of naturalists.

Though largely aquatic and nocturnal, occasionally these big snakes may be seen shortly after sunrise basking among the rocks along the shore, before returning to the water where they are active till about 10.30 a.m. During most of the day they frequent crevices in the underwater rocks or, at Kigoma, among the submerged sandbags surrounding the pier at which the s.s. *Liemba* ties up. Daily at Mpulungu from the 11th to 27th August, cobras were visible entering or leaving crevices among the rocks below and around the *Liemba*, or occasionally, before 10 a.m. or after 4 p.m., basking while still partially submerged. Towards 4 p.m. they again appear to become more active.

When in the water, except when coming up to breathe, aquatic cobras appear to spend most of their time well below the surface. They seem shy, wary, and not in the least aggressive, so that the local people show no hesitation in bathing in the haunts of these reptiles. Such powerful snakes are difficult to dislodge from among the rocks, especially if the anterior portion has been able to secure an anchorage when the tail end is seized. On being captured an aquatic cobra almost invariably spreads its hood and gapes widely, but there is no spraying of venom.

With a single exception, all cobras taken at Mpulungu were caught in the evening, for this is the time they tend to cruise along the coastal rocks—visiting one cranny after another before departing for the open lake. Such behaviour is in sharp contrast to their return at daybreak, for then most snakes steer a fairly straight course to the rocks among which they usually disappear with a minimum of delay.

On the 23rd May, 1956, when in the vicinity of Kalalagabo, Kigoma, Ionides observed a five-and-a-half-foot cobra swimming on the surface of the lake with head above water. In her jaws was the head of a large fish she was propelling towards a rock. On reaching her objective the snake emerged and was engaged in swallowing the fish when Ionides seized her. Promptly she disgorged her prey, spread a hood, and demonstrated with wide-open mouth. After her captor had paddled ashore and consigned the cobra to a bag, he returned for the fish, but it had disappeared.

Another large ♀, taken at Mpulungu on the 30th August, 1958, was sent to the Coryndon Museum where, on the 9th September, 1958, she laid 22 eggs. Yet a third ♀, captured at Mpulungu on the 17th August, 1958, deposited eggs in September at the Chicago Zoo, Brookfield Park, Illinois.

An exceptionally interesting observation made by Ionides was the presence of ticks (*Aponomma latum*) infesting the head of a ♀ cobra taken at Mpulungu. For identification of the ticks the collector is indebted to Miss J. Walker.

A GUIDE TO EAST AFRICA'S COMMON ACACIAS

By JOHN SELDON, M.A. (CANTAB.)

I. Flowers in spikes or spiciform racemes

A. PODS FLAT, DEHISCENT, not twisted.

B. PODS OBLONG, BLUNTLY POINTED

C. *Flowers shortly-pedicellate.* Pods reticulate.

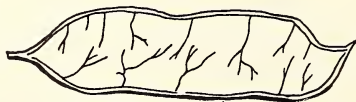
1½ to 2 in. long; about ½ in. broad, unequal at base.

A. mellifera



CC. *Flowers sessile or sub-sessile.* Pods papery, sandy brown 1½ to 4 in. long; ¾ to 1 in. broad; reticulate, sometimes constricted—due to abortion of some seeds.

A. senegal



BB. PODS OVATE to BROADLY OBLONG, SLIGHTLY CURVED, OBTUSE. They are also glabrous, coriaceous and shining brown 1½ to 2 in. long; ½ to 1½ in. broad.

A. lahai



BBB. PODS BROADLY, FLAT, POINTED. These nearly straight pods are persistent, 4 to 6 in. long; ½ to ¾ in. wide.

A. polyacantha subsp. *campylacantha*



A simple key to a mere 15 of the commonest species of Acacia likely to be encountered by field-workers or schoolchildren in East Africa. There are 67 indigenous species in all.

Flowers white. A bushy plant with paired recurved thorns; 2 to 3 pinnae; leaflets 1 to 2 pairs. Bark cooked with meat and used as a stimulant. Gregarious in thornbush country. The 'Wait-a-bit' thorn.

Flowers white or pale yellow. A flat-topped tree, when mature; 3 to 10 pinnae; leaflets 10 to 15 pairs. Prickles in threes, near the nodes, the central one hooked or solitary. The leaves are small, olive-green in colour and shorter than the inflorescence spikes. Bark grey, rough. The main source of 'gum arabic'. Wide distribution in thornbush. The 'Sudan gum arabic tree'.

Flowers white, opening from red buds. A flat-topped tree up to 50 ft.; 6 to 13 pinnae; leaflets 12 to 20 pairs. Stipules spinescent. Bark grey-brown, fibrous. Very hard durable red wood. The characteristic high-altitude (6-7,000 ft.) species of Acacia, often growing in pure societies below evergreen forest. The 'Red thorn'.

Flowers white. Quick growing flat-topped tree up to 40-50 ft.; 15 to 32 pinnae; leaflets 10 to 40 pairs. Spines in pairs, recurved decurrent with bases, brown with black tips—giving rise to the name 'Falcon's Claw Acacia'. (Rarely, however, these prickles are absent.) Bark ash-grey to pale yellow, rough, with yellow-brown scales. Heartwood is impregnated with resin making a more durable, termite-resistant building material than in most Acacias. A gregarious tree on damp ground, e.g. vleis and swamps. The 'Stink-bark Acacia' is a common name for this tree.

AA. PODS THICK, INDEHISCENT, TWISTED. Contorted and falcate, or spirally twisted. Yellow-brown.

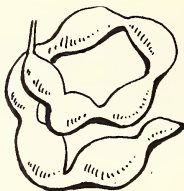
A. albida



II. Flowers in globose heads.

D. PODS SPIRALLY TWISTED. \pm pubescent; yellow-brown.

A. tortilis subsp. *spirocarpa*



DD. PODS NOT TWISTED.

E. PODS INDEHISCENT, FAT.

F. Pods sinuate, with slightly thickened margin, also stipitate, pubescent; $2\frac{1}{2}$ to $4\frac{1}{2}$ in. long; $\frac{1}{2}$ to $\frac{3}{4}$ in. wide.

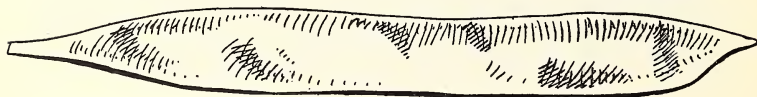
A. nilotica subsp. *subalata*



FF. Pods not sinuate, nor marginate.

G. Pods and corolla glabrous. Pods brown, linear oblong 4 to 8 in. long; $\frac{3}{4}$ to 1 in. broad and $\frac{1}{2}$ in. thick; straight or slightly curved; stipitate.

A. sieberiana



Flowers white or cream. Large tree with rounded crown; 3 to 8 pinnae; leaflets 9 to 16 pairs. Stipules usually spinescent. Bark rough, grey brown. The pods are a useful fodder. Groves of these trees are often an indicator of underground water supplies. Locally common on alluvium in T.T. Strange shapes of pods give rise to the name 'Apple-ring Acacia'. Heartwood soft and easy to work; seasons well.

Flowers white or pale yellow, usually in small globose heads. Flat-topped or umbrella-shaped tree up to 45 ft. with interlaced boughs, spreading horizontally; 4 to 10 pinnae; leaflets 7 to 15 pairs. Bark rough; branches red-brown, pubescent. Spines small and hooked, or long and straight, up to 3 in.—often both types on same branchlet. Rich alluvial soils in thornbush country; gregarious. The 'Umbrella Acacia'.

Flowers yellow, scented. Shrub or small tree up to 20 ft.; 3 to 10 pinnae; leaflets 12 to 28 pairs. Bark dark brown to black, not flaking but cracking to show a rust-red layer. Spines slender and straight, directed downwards and outwards. Widespread in dry savanna. The bark and roots yield a decoction with intoxicating properties; a stimulant of strength and courage for Masai youths! Bark and pods also have a high tannin content; the poles are durable.

Flowers white or cream, fragrant; peduncles clustered at the nodes. Flat-topped tree up to 50 ft. with almost glabrous twigs; 9 to 20 pinnae; leaflets 20 to 40 pairs. Spines round, straight, strong up to 4 in.; often absent from branches and branchlets. Bark scaling to show a yellow surface. Tree of savanna and grassland near rivers. Common in T.T. and Uganda; rare in Kenya. Yields a clear gum of good quality.

- GG. Pods and corolla \pm densely pubescent. Pods sausage-shaped; 4 in. long, $\frac{3}{4}$ in. broad

A. stuhlmannii



EE. PODS DEHISCENT, THIN.

- H. Prickles scattered along the internodes not grouped at or near the nodes. Pods oblong up to 6 in. long and $\frac{3}{4}$ to $1\frac{1}{2}$ in. broad, walls papery.

A. brevispica



HH. Prickles or spines grouped at or near the nodes.

- J. Spines not ant-galled.

- K. Pods long, linear, falcate; glabrous when mature; seeds somewhat conspicuous in the pod. Pods up to 4 in. long and $\frac{1}{4}$ in. broad, dehiscing on the tree; shortly stipitate.

A. seyal



- KK. Pods flat, narrow and slightly curved, with distinct slender stipe; 2 to 3 in. long, up to $\frac{1}{2}$ in. wide; margins keeled, often sinuate.

A. xanthophloea



JJ. Spines ant-galled.

- K. Pods short, falcate, attenuate at both ends; about 2 in. long, $\frac{1}{2}$ in. wide; shortly puberulous. Ant galls \pm round or ovoid.

A. drepanolobium



Flowers white. Small tree up to 8 ft. high with short bole and radial branching; 6 to 14 pinnae; leaflets 9 to 20 pairs. Young shoots with spreading soft golden hairs; older branches densely hairy, grey, brown or blackish. Thornbush country and margins of mangrove swamps; an indicator of saline soils; locally common.

Flowers white or yellowish white. Shrub or small tree, often semi-scandent and forming coppice. No ant galls; 6 to 18 pinnae; leaflets numerous. Easily recognised by its numerous slightly curved scattered prickles. Somewhat like *Mimosa pigra*, except for the pink flowers and curved hairy lomentose pods of the latter. Widespread in East African bushland, thickets and scrub. Was once referred to as *A. pennata*. Sometimes called the 'Pinnate Acacia'.

Flowers bright yellow; peduncles on elongate lateral or terminal shoots of the current season. Shrub or small tree up to 50 ft.; loosely branched; 1 to 9 pinnae; leaflets 8 to 20 pairs. Bark green-brown, or orange; powdery. Not to be confused with the papery-barked shrubby *A. hockii*, which was once referred to as *A. seyal* var. *multijuga*. Gregarious on alluvium of river courses. The so-called 'Fever Thorn'. Yields an edible gum but inferior to that from *A. senegal*.

Flowers pinkish white or yellow; peduncles on short scaly lateral shoots. Tall flat-topped tree up to 60 ft.; 5 to 10 pinnae; leaflets 15 to 20 pairs. Bark sulphur or greenish-yellow; powdery, but not rubbing off easily. Spines very short. The so-called 'Fever Tree.'

Flowers white. Tree or shrub of variable habit up to 25 ft. high; 5 to 9 pinnae; leaflets 12 to 20 pairs. Bark not peeling. Masai plains and widespread elsewhere, though absent from the coast and the southern provinces of T.T. N.b. Myrmecophily and hence the 'Whistling Thorn' name.

- KK. *Pods long, linear, falcate*; glabrous; 3 to 4 in. long, about $\frac{1}{4}$ in. wide.
Ant galls \pm *bi-lobed*.

A. zanzibarica



- KKK. *Pods long linear, falcate*; similar to a typical *A. seyal*, i.e. seeds somewhat constricted in the pod, glabrous when mature. Pods from 4 to $7\frac{1}{2}$ in. and not more than $\frac{1}{4}$ in. wide.
Ant galls \pm *bi-lobed*.

A. seyal var. *fistula*

Glossary of Botanical Terms used in this Key

(Based on that printed for *The Flora of West Tropical Africa*)

ATTENUATE:	Drawn out to a point.
CORIACEOUS:	Leathery in appearance or texture.
DECURRENT:	Running back down the main stem or petiole.
(or Recurrent)	
DEHISCENT:	Splitting open spontaneously when ripe.
FALCATE:	Curved like a scythe or sickle.
GLABROUS:	Smooth, devoid of hairs.
HEAD:	Flower stalks, or pedicels, arising from the same point on the inflorescence axis.
INFLORESCENCE:	A collection of flowers; their arrangement.
KEELED:	Ridged along the middle of a flat or convex surface.
LINEAR:	Long and narrow with parallel edges.
MARGINATE:	Having a conspicuous flattened or raised edge.
MYRMECOPHILY:	A supposedly symbiotic relationship (living together for mutual benefit) between ants and the plant.
OVATE:	Egg-shaped with the broader end below the middle.
PEDICEL:	The stalk of an individual flower in an inflorescence.
PETIOLE:	The stalk of a leaf.
PINNA:	A primary division of a pinnate leaf, i.e. a compound leaf with leaflets arranged on either side of a common rachis; such leaflets are often called <i>pinnules</i> , but not in this key.
PRICKLE:	A sharp outgrowth of the bark, detachable without tearing the wood.
PUBERULOUS:	Shortly pubescent.
PUBESCENT:	Covered with short soft hairs.
RACEME:	An inflorescence in which the flowers are borne on pedicels along an individual axis, or <i>peduncle</i> .
RETICULATE:	Having a net venation, i.e. when the veins form a network pattern.
SESSILE:	Without a stalk.
SINUATE:	Having an uneven margin with somewhat deep undulations.
SPIKE:	A racemose type of inflorescence with the flowers sessile on a simple undivided axis or <i>rachis</i> .
SPINE:	A sharp-pointed hardened structure, usually a branch, but sometimes a stipule, petiole, etc.
STIPITATE:	Supported on a special stalk or <i>stipe</i> ; in the case of <i>Acacia</i> pods this stipe is between the remains of the calyx and the wider part of the fruit itself.
STIPULE:	Leaf-like or scale-like appendages of a leaf, usually at the base of the petiole.
THORN:	Sometimes used (but not in this key) as a term for a pointed stiff outgrowth: in origin it can be epidermal, but usually it refers to an aborted or modified branch, leaf, leaflet or stipule.

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1. *Flora of Tropical East Africa*. Leguminosae sub-family Mimosoideae, by J. P. M. Brenan. Published by the Crown Agents. Available from the Government Printer, Nairobi. Shs. 12.00.
2. *Kew Bulletin*. Tropical African Plants and Notes on Mimosoideae, by J. P. M. Brenan. 1950-55.

Flowers yellow. Tree up to 25 ft. high; 1 to 6 pinnae; leaflets rather large, in 3 to 10 pairs. Bark yellow-orange and powdery. The 'Whistling thorn' which takes the place of *A. drepanolobium* in coastal areas, where it is gregarious on poorly drained soils.

As for *A. seyal* BUT spines often swollen at the base into grey or whitish ant galls, sometimes with reddish-brown markings. Common on black flooded soils throughout T.T.; widespread but less common in Kenya; also in Uganda.

Exotic Species of Acacia

Most of the common species of Acacia in cultivation are natives of Australia.

The following three species all have flowers in round heads and also, in adult specimens, the leaves have been replaced by *phyllodes*. The latter are green, flattened petioles, modified for photosynthesis, perhaps as an adaptation to xerophytic conditions. In juvenile specimens all stages of transition from the ancestral pinnate compound leaf form to the phyllode type can usually be found.

Phyllodes with one main longitudinal nerve.

Phyllodes elliptic, pubescent 1. *A. podalyriifolia*.

Phyllodes oblong-lanceolate, falcate, glabrous 2. *A. pycnantha*.

Phyllodes with 2 to 7 or more main longitudinal nerves 3. *A. melanoxylon*.

But the fourth common species has the normal bipinnate leaf

4. *A. mearnsii*.

1. *A. podalyriifolia*. A very common small tree in gardens; a so-called 'Golden Wattle'. Numerous small heads of yellow flowers arranged in racemes; pods flat and somewhat twisted.

2. *A. pycnantha*. Another 'Golden' or 'Broad-leaved Wattle'; a small tree with rather pendulous habit and glabrous twigs. Flowers in golden yellow heads arranged in racemes; pods glabrous, linear, obtuse, somewhat constricted between the seeds.

3. *A. melanoxylon*. A medium-sized, much-branched evergreen tree. Flowers in very small heads, yellow or cream, and arranged in racemes; pods twisted. This is the Australian 'Blackwood'.

4. *A. mearnsii* auct. *mollisima*. A quite large, much-branched tree with pubescent twigs and foliage. The leaflets are very small and numerous. Flowers in pale yellow heads arranged in panicles or racemes; pods linear, narrow, constricted between the seeds. This is the 'Black Wattle' of plantations; its bark is used for tanning and its wood for fuel. It is also a 'shade' tree, although very little will grow beneath it.

There are some seventeen other introduced species of Acacia; for these see the key to exotic species in *The Flora of Tropical East Africa*, pp. 49 to 53.

In making this selection of the more common Acacias of East Africa the writer has had access to the pressed specimens in the East African Herbarium (behind the Coryndon Museum). He has also had the patient assistance of Dr. P. J. Greenway and the staff of the Herbarium.

BIRD RINGING IN EAST AFRICA

By F. L. REYNOLDS

(*Ex Officer, Ringing Sub-committee*)

About a year ago a special committee was set up to consider how to encourage bird ringing in East Africa. For those of our members who are not familiar with this popular form of research, the following is a short account of the decisions already taken, together with an indication of what has been accomplished outside these territories.

Bird ringing, or banding as it is called in the United States, is a comparatively new method of marking birds, although its development can be traced back for many hundreds of years. Before any work on bird behaviour can be accurate enough to satisfy the scientist, it is necessary positively to identify individual birds on each occasion. This can be done in a variety of ways, but the most satisfactory and the longest lasting is to fix a tag, or ring, to the bird's legs: occasionally clips in the wings have also been used.

The capture of the birds without harming them, the fixing and recording of the numbered rings, the recovery of the rings, and exchange of information regarding the recoveries through report centres back to those interested is all part of the technique of bird ringing. Throughout the world there are a considerable number of organisations and individuals engaged in the practice and the exchange of information about recoveries. Most European countries, the United States and South Africa participate, and even Russia has for some years been in the habit of reporting recoveries of birds ringed in other countries. There are 593 holders of ringing permits in Britain, and 1,750,000 birds have been ringed there since work started in 1909.

There are three types of problems connected with birds which can be investigated by the use of rings. First, there are questions of bird behaviour. For those interested in working out details of all such actions as nest-building, feeding at the nest, territorial and courtship behaviour, it is essential to be sure that any individual bird can be identified. This can be done by colour rings, which allow identification without interfering with the bird's liberty. Then there are questions of local movement. Much has been learned of the movements of young birds soon after they have left the nest, and there is much of interest we should like to know about the movements of species at different seasons within East Africa; this can be done by ringing and recovery within the territory. Thirdly, and this is really only an extension of the last, there is the tracing of the great stream of migrants which move from one continent to another. A great deal has already been discovered about such movements, but there still remains much to be learned regarding these seasonal movements of birds, especially in and through East Africa, on migration. For this study ringing is the most valuable tool in the hands of the research worker and moreover it is a field in which the serious amateur can do a very great deal to assist the professional investigator.

To further such researches in its area, the East Africa Natural History Society has set up a special ringing sub-committee, and the Coryndon Museum has agreed to act as a report centre: this it has already been doing for Dr. Disney who has been working on *Quelea* control. Although it is not at present proposed that the Committee will carry out any ringing programme itself, it will assist would-be ringers by providing them with rings, record forms, advice on ringing and instruction on trapping and actual ringing technique. In addition, this Committee will act as recorders and as a clearing house for information regarding recoveries. It will

co-ordinate schemes to avoid overlapping, and in due course it is hoped to publicise actual schemes in order to ensure that reports of ringed birds are received from African sources. The co-operation of the Game Department has been promised, and this is most necessary since their permission is needed in each case where the trapping of birds is undertaken.

The Committee has also prepared a ringing code which all would-be ringers must agree to observe before their applications to take part in any ringing scheme are accepted.

The salient points of this code are:-

1. The object of ringing is serious scientific study.
2. Ringing must in no way endanger the health or impair the chances of survival of the bird.
3. Ringed birds must be accurately identified.
4. Accurate records must be kept and forwarded punctually to the recorders.
5. Ringers are responsible for obtaining their own trapping permits from the Game Departments concerned, after obtaining approval from the Society.
6. No transfer of rings or delegation of ringing to other individuals is permitted.
7. Ringers must not publish their records without approval of the Society.

Readers of Dr. V. van Someren's *A Bird Watcher in Kenya* will remember the interesting account of the behaviour of the Fiscal Shrike. Much of this was made possible by the use of colour rings, and there is no need to start with an ambitious ringing scheme; simple observations of birds in one's own garden can be an introduction to a more serious study.

The East Africa Natural History Society is aware that there are a number of members who wish to take on some active work, and feels that this is a real opportunity for such members to undertake studies which will be a worthwhile contribution to the ornithology of Kenya. Will those who are interested and would like further details, please write to the Secretary, who will pass such requests to the ringing sub-committee. They will gladly help and discuss any project proposed. Expert advice is available, so, after deciding what problem might be studied, and ensuring that the necessary time can be given to serious work, the Committee will tell you in what way they can assist, and provide rings and record forms on payment, after the necessary trapping permits have been obtained. Unless you have previous experience in ringing, you will be expected to work for a short time with an experienced ringer, since birds must be trapped and ringed without damaging them in any way. This alone is worth preliminary investigation before the project is undertaken.

It is hoped that in due course it may be possible to establish stations for ringing migrants similar to those run by local committees under the auspices of the British Trust for Ornithology in Britain. Here it will be possible for those who have not the time to run a scheme of their own, to assist in more ambitious projects which may well need the assistance of Society members.

EAST AFRICAN SLUGS OF THE FAMILY UROCYCLIDAE

By B. VERDCOURT, PH.D., F.L.S., B.S.C.

Introduction

A revision of the African slugs is much needed but could not possibly be carried out with the materials available. Considerable collections of material, particularly topotypes, properly drowned and preserved for dissection purposes are necessary. Studies of the development of the genitalia in single species are needed, since many names have been based on immature individuals. The descriptions and type localities have been so vaguely defined in many cases, that the exact identity of some of the published species will never be ascertained. The anatomy of some of these species has not been illustrated.

A collection of slugs made by myself in the E. Usambara Mountains in Tanganyika during 1950 was in the hands of the late Hugh Watson of Cambridge, England and still awaits examination. A few specimens have also been sent to Berlin for examination by Dr. Urban, a pupil of Dr. Jaekel. A detailed account of the anatomy and histology of *Trichotoxon thikense* Verdcourt has been given by Dr. Urban in an unpublished thesis 'Anatomie und Histologie von *Trichotoxon thikense* Verdcourt (Ein Beitrag zur Kenntniss der Urocyclinæ): Inaugural—Dissertation Humboldt-Universität, Berlin, Sigrid Urban, 1958.' All my spirit material is otherwise preserved in the Coryndon Memorial Museum, Nairobi.

These notes present a synopsis of the East African slugs, in the hopes that collectors will be stimulated to collect material which will be available for a future monographer. Series are needed of both mature and immature forms of the same species. Several new species have been described in this paper since some of the commonest species in the Nairobi area, including one or two of economic importance, are apparently undescribed.

Three families of slugs are represented in East Africa, namely, Veronicellidae, Urocyclidae and Limacidae. The latter family has been recorded on two occasions. Simroth (1897)¹ records *Agriolimax laevis* (Müll.) from Zanzibar, collected by von der Decken long ago. Recently quite large numbers of a small *Agriolimax* have been collected in a Nairobi, Kenya, garden by Mr. J. G. Williams; the late Mr. H. Watson has determined these as *Agriolimax laevis andicola* (D'Orb.). Other species may have been introduced but have not been recorded. The Veronicellidae have been monographed recently by Forcart (1953).²

The complete dissection of a slug is a difficult procedure but an examination of the genitalia for identification purposes is not difficult, provided that a mature individual is chosen and that it has been drowned outstretched prior to preservation. The slug should be slit down both fringes with very fine dissecting scissors, being most careful to keep the points tending outwards so as not to sever any internal organs. The neck tissue can then be cut from right to left and with care the entire back can be separated from the foot. The genitalia can then be seen as a complex mass of organs which, when followed forwards, end in a pore leading to the outside just behind the right-hand tentacle. With care it is possible to completely unravel the organs and their ducts.

Care must be taken with the hermaphrodite gland and its duct. This gland is usually buried in the folds of the liver and the duct is tenuous. The names of the various organs can be made out from the various diagrams accompanying this paper.

¹ Die Nacktschnecken Ost-Afrikas, Deutsch Ost-Afr. 4(2): 5 (1897).

² The Veronicellidae of Africa. Ann. Mus. Congo Belge, 8^o Zoo. vol. 23 (1953).

List of Slugs described from East Africa

This list has been delayed until the end of the paper since owing to the fact that it will appear in parts, publication at this stage would mean the appearance in print of names not yet validated.

KEY TO THE GENERA OF UROCYCLIDAE RECORDED FROM EAST AFRICA

1. Visceral cavity not penetrating the foot behind the mantle, but anterior as in the *Helicariionidae*; flagellum elongated *Leptichnus*
1. Visceral cavity extending to extreme posterior of the foot 2
2. Dart sac or similar gland not present 3
2. Dart sac or similar gland present but not always secreting a dart; sometimes quite small 5
3. Epiphallus without flagella *Phaneroporos*
3. Epiphallus with flagella 4
4. Flagellum vestigial; hermaphrodite gland lodged in extreme extremity of the liver *Atoxon*
4. Flagellum long; hermaphrodite gland sited between the albumen gland and the uterus *Dendrolimax*
5. Atrium and dart sac distinct, accessory to each other; dart sac small not secreting a dart (called prostate gland by Pollonera) 6
5. Atrium and dart sac joined, large; nearly always secreting a dart save in sub-genus *Atrichotoxon* *Trichotoxon* 8
6. Dart sac elongate, clavate, furnished with retractor muscles 7
6. Dart sac more or less globose or if clavate then without retractor muscles; with small lateral retractors or completely lacking them *Bukobia*
7. Dart sac with lateral retractors *Urocyclus* sub-genus *Mesocyclus*
7. Dart sac very well-developed, with strong apical retractors *Urocyclus* sub-genus *Urocyclus*
8. Oviduct entering distal end of combined atrium and dart sac 9
8. Oviduct entering at the base or middle of the combined atrium and dart sac 10
9. Four to six darts in pairs in secondary sacs sub-genus *Trichotoxon*
9. No darts in the dart sac sub-genus *Atrichotoxon*
10. Eight to many darts in the dart sac sub-genus *Polytoxon*
10. One spiral dart in the dart sac sub-genus *Spirotoxon*

ENUMERATION OF THE SPECIES

LEPTICHNUS

Simroth in Abh. Senck. Naturf. Ges. 19, 296, t.1, f. 7-11 (1896)

Visceral cavity not penetrating the foot to the rear of the mantle but anterior as in the *Helicariionidae*. A long flagellum is present as in *Dendrolimax*. Shell cap-shaped, covered save for a pore over the end. Foot slender, back keeled above and scarcely twice as long as the mantle. Penis long and slender; epiphallus slender with two flagella; spermatheca spherical with very long duct; spermatophore spiral with smooth tube and long narrow apically toothed tail. Dart sac wanting.

L. fischeri Simroth, loc. cit. (1896)

Slug about 2.2 cm. long, pale buff with two brown principal stripes.

TANGANYIKA. Simroth merely states 'Deutsch-Ost-Afrika' leg. Fischer with no further details. The specimens are presumably at Berlin but were not found there.

The following slug appears to belong to this genus since the last 8 mm. of the foot are solid and not filled with viscera and there are two long flagella on the epiphallus. The banding of the mantle such as is found in the typical species was not shown by the present specimen. It is presumably a new species, but only one specimen is available so it has been left undescribed.

Leptichnus sp.

A small slug with a very characteristically granulate mantle, the granules so acute as to make the mantle appear prickly. Body pale in front, striped and spotted with purple-brown behind, mantle purple-brown with scattered white spots. Hind body keeled. Total length 2.7 cm., mantle 1.7 cm. long, free front part 5.5 mm. long, pulmonary aperture 8.7 mm. behind the anterior margin. The

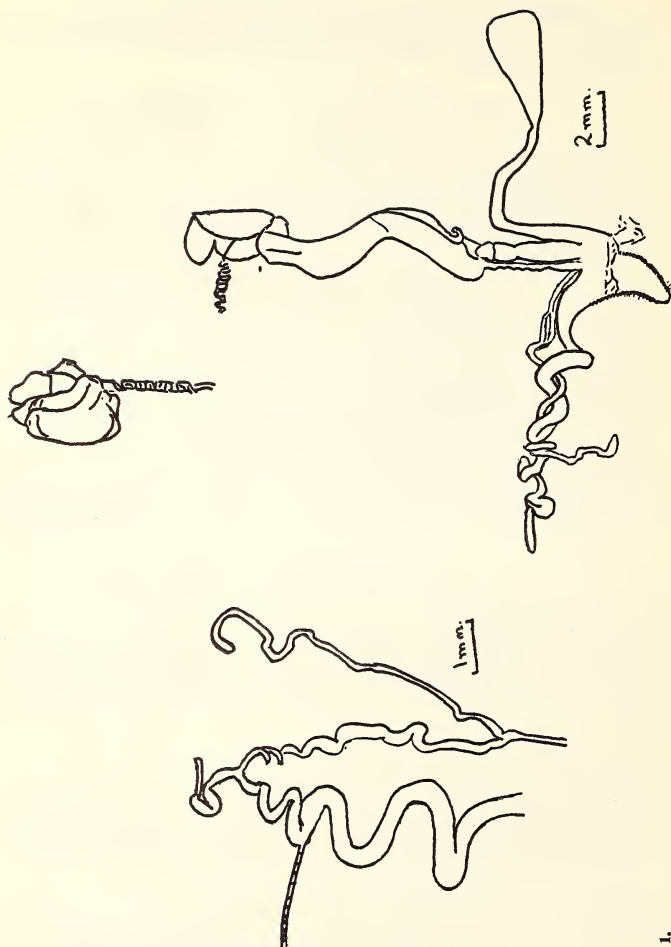


Fig. 1.

viscera do not extend into the rear of the foot, the last 8 mm. of which is solid. The spermatheca is flask-shaped, 4 mm. long and 2 mm. wide, the duct slender, 7 mm. long. The flagellum is very long, 7.5 mm., and the penis 6 mm. long. In the specimen dissected the denticulate verge was exerted. The jaw is of the normal Helicarionid type, 1.75 mm. wide with truncate ends and a median rounded projection. The radula is about 3.5 mm. long and 1.5 mm. wide. The central tooth is tricuspidate with the median cusp much longer than the two accessory cusps. There are 23 lateral and transitional teeth which are also tricuspidate, the endocone narrowly adnate to the mesocone, but the ectocone quite separate. There are about 50 marginal teeth, the inner ones of the normal Helicarionid type with markedly bifid cusps, the inner cone being the largest and the last 10-15 in each row with extra cusps (up to a total of six). This is irregular since some may be two-cusped even near the margin. These multicuspitate teeth are particularly noticeable in the stained nascent rows. (See fig. 1).

TANGANYIKA. East Usambaras, Amani, Mt. Bomole, leg. B. Verdcourt.

PHANEROPORUS

Simroth in Nova Acta Leop.-Carol. 54, 61 (1889)

Shell with apical nearly symmetrical nucleus, ovate, feebly arched, covered save for a pore at the posterior end of the mantle. Genitalia lacking dart sac; vas deferens short without appendages. Penis clavate with apical retractor; spermatheca slender, tube-like.

Genotype, *P. reinhardtii* Simroth

Key to the species

Penis clavate; epiphallus not present	:	:	:	:	:	:	:	<i>P. reinhardtii</i>
Penis tubular; epiphallus long	:	:	:	:	:	:	:	<i>P. unicolor</i>

P. reinhardtii Simroth in Nova Acta Leop.-Carol. 54, 61, t.3, f.2, 4, and 17 (1889)

Slug with grey-brown sides and pale keel. Mantle reddish with dark lateral bands and dark fleckings between them.

The narrow penis is swollen into an ellipsoidal sac at the distal end, just below the retractor; the vas deferens enters direct near the top and there is no epiphallus. The spermatheca is tubular, barely enlarged at the apex.

TANGANYIKA. No data given.

P. unicolor Simroth in Abh. Senck. Naturf. Ges. 18, 306, t.1, f. 7 and t. 2, f. 11 (1894)

Slug about 3 cm. long (judging by the figure), fringe and fore-part of body below the mantle, pale yellow-brown, rest of body grey, tinged with violet. The mantle is shown as dark brown with vague spots and a narrow yellow-brown margin. Simroth figured the undeveloped genital organs. The vagina is short and tubular; the penis is long and narrowly tubular, U-shaped; the epiphallus is narrower but as long as the penis. The spermatheca and duct are tubular, slightly clavate distally, about as long as the penis. The hermaphrodite duct is very long.

TANGANYIKA. East Usambara Mountains, leg. L. Conradt.

ATOXON

Simroth in Nova Acta Leop.-Carol. 54, 58 (1889)

Small to medium-sized slugs. Genitalia without dart sac; epiphallus with a well-developed lime gland and sometimes a minute vestigial flagellum.

Genotype, *A. hildebrandti* Simroth, a Somaliland species.

The species in this genus are most ill-defined and series of strict topotypes are needed for comparative dissections. Many of Simroth's species were poorly described from quite inadequate material, often from immature specimens; moreover the type localities are often not defined. A key is not feasible but the following may help to guide one to the nearest description. The shape of the spermatheca depends partly on whether or not it contains a spermatophore.

A. Spermatheca elongate, gradually passing into a duct shorter than itself:

Brown or buff with marked stripes; spermatheca pear-shaped, drawn out at the apex

Buff-grey with numerous flesh-coloured granules; spermatheca ovoid-oblong with small apical accessory sac, the whole about four times as long as the narrow duct *A. taeniatum*
A. kiboense

Dark brown with interrupted stripes and spots; spermatheca elongate, tapering, about three times the length of the duct *A. brunneum*

Buff with brown stripes; spermatheca elongate, passing very gradually into a duct about two thirds of its length *A. flavum*

Pale brown with deep brown stripes on the mantle and interrupted stripes on the body and/or oblique curved interrupted stripes; spermatheca elongate, blunt, twice the length of the duct *A. lineatum*

Pale ochraceous, mantle with four confused brown stripes and spots, sides pale chestnut irregularly zoned and with obscure stripes and minute spots; spermatheca twice as long as the duct *A. ornatum*

- B. Spermatheca more globular and more abruptly passing into a duct longer than itself or at least equal.

Buff-brown with grey stripes and spots; spermatheca globular, half the length of the duct *A. variegatum*

Yellow-buff with orange-brown spots; spermatheca "with narrow end lobe and long stalk" *A. aurantiacum*

Grey-brown with dark stripes; spermatheca globular, five eighths the length of the duct *A. carli*

Yellowish with pale brown stripes; spermatheca globular, two thirds the length of the duct *A. cavalli*

Ochraceous with a single pale band on each side; spermatheca globular, with duct twice as long or longer; vagina long and atrium inflated *A. fuelleborni*

Several species have been described from juveniles and consequently their anatomy is unknown or virtually so. These are enumerated first.

A. robustum Simroth in Die Nachtschnecken Ost-Afrikas 10, t.1, f.8 (1897)

About 3.1 cm. long, similar to *A. variegatum* with brown stripes distinct on the mantle and a brown reticulation between them. Topotypic material should be easy to obtain since the locality is known accurately.

TANGANYIKA. Kome Islands, leg. Stuhlmann.

[*A. pallens* Simroth, *op. cit.* 7, t.1., f.2A & B (1897)]

1.4-2.5 cm. long, pale yellow-buff with obscure stripes on the mantle and tail. The young have dark stripes.

BELGIAN CONGO. N.W. of L. Albert, Kirima, leg. Stuhlmann.]

A. martensi Simroth in Reise in Ostafrika A. Voeltzkow 1903-5, Wiss Ergebn. 2, 607, t.26, f.15 (1906-10) (1910)

3.3 cm. long, grey-brown with black-brown stripes and spots; the spots are arranged in a vague lateral band on the sides and the mantle. There are scattered spots below this band and the flanks below the mantle are pale.

No accurate data given; 'Ostafrika' leg. Stuhlmann (type presumably in the Berlin museum).

[*A. brunneum* Simroth in Die Nachtschnecken Ost-Afrikas 8, t.1, f.3, t.3, f.2 (1897); Pilsbry in Bull. Am. Mus. Nat. Hist. 40, 287, pl. 8, f.1 & 2 (1919)]

3.8 cm. long, brown with brown or greyish, lateral dark stripes and spots; or olive-brown with white longitudinal grooves and minute white reticulation and slightly darker lateral bands, together with some angular black spots; mantle also with black spots. Spermatheca elongate, tapering, about three times the length of the duct (judging by the figures but Simroth says 'of equal length' in his text; he also mentions and figures a small lateral sac on the spermatheca but this was probably abnormal or an artefact).

BELGIAN CONGO. Ruwenzori, in forest at Semliki Ferry, leg. Stuhlmann; Butagu Valley, leg. Bequaert.]

[*A. flavum* Simroth in Die Nachtschnecken Ost-Afrikas 9, t.1, f.5 (1897); Pilsbry *op. cit.* 289 (1919)]

A buff-coloured slug with brown stripes, 2.8-3.7 cm. long. Simroth's original specimen had the

genitalia weakly developed; he states that the rather long receptacle is about the same length as its duct.

BELGIAN CONGO. West of L. Albert Edward Kishakka (Katambaru), leg. Stuhlmann. Pilsbry *op cit.* 289, pl. 8, f.6, t.f. 146 describes a subspecies *rutshuruense* which he figures as having a narrow, elongate spermatheca passing very gradually into a duct about two thirds of its length.]

A. lineatum Simroth in Die Nachtschnecken Ost-Afrikas, 10, t.1, f.9 (1897); Simroth in Rev. Suisse de Zool. 20, 34 t.3, f.2 (1912); Simroth in Abh. Senck, Naturf. Ges. 19, 282 (1896)

About 2.3-4.5 cm. long, pale brown with deep brown stripes on the mantle; interrupted dark brown stripes on the body and/or oblique curved interrupted stripes on the body. Spermatheca elongate, somewhat constricted below, twice as long as its duct. The original description indicates that the genitalia were not fully developed but they are however figured in the later reference.

TANGANYIKA. S. Victoria Nyanza, Kome Islands leg. Stuhlmann (type); Bukoba, Bussiro Islands (Carl); Waterigi Hugel (Neumann) locality not traced. (The 1897 reference was meant to appear first.)

Atoxon *sp. aff. A. lineatum* Simroth.

Body with ground colour grey, sides paler beneath the mantle in front. There is one continuous blackish-brown stripe on either side of the mantle and an almost continuous blackish-brown stripe carrying on on either side of the hind body. The hind body is not keeled but there is a white keel line (in life, yellowish in spirit.) The mantle is finely polygonally reticulate; the posterior margin is slightly sinuate. The pallial aperture is very small and the pulmonary aperture is also small and situated 9 mm. from the anterior margin. The area between the stripes on the hind body is dark, save for this keel; the central area between the mantle stripes is marked with obscure dark marks. The total length of the animal is 4.8 cm. and the height near the mantle 1.2 cm. The mantle is 1.5 cm. long. The sole areas are 4, 2.5 and 4 mm. wide respectively, the outer areas transversely striate. The shell is broadly oval, 6.5 mm. long and 5 mm. wide, thickish with hyaline margins; the nucleus and surrounding area is whitish, the rest of the shell yellowish-horn. The sculpture consists of concentric ridges and irregular radial striae; the nucleus itself has faint, close concentric, undulating striae. The genitalia are illustrated in fig. 2. The spermatheca is oblong, constricted about the middle and the duct is very short. Of the organs not illustrated in the figure the hermaphrodite gland is ovoid, 5 mm. long and 5.2 mm. wide; the hermaphrodite duct is 4.3 cm. long, convoluted close to where it runs into the albumen gland; the latter is narrowly tongue-shaped, much divided into small lobes, 2.5 cm. long and 5 mm. wide. The common duct is much convoluted 5.7 cm. long.

KENYA. Mt. Marsabit, in the forest, leg. B. Verdcourt.

On a previous visit the year before, I discovered a juvenile of what is probably the same species, although the hind body is slightly keeled.

Animal 3.4 cm. long and 8.5 mm. wide, mantle 15.5 mm. long. Hind body keeled only at the posterior end. Body buff-brown with black markings; the mantle has a broad and distinct dark band on each side and some dendritic marks and spots between the bands; on each side of the hind body is a distinct dark stripe with scattered black spots, both below and above it. The genitalia were undeveloped.

KENYA. Mt. Marsabit, leg. B. Verdcourt.

A. kiboense Verdcourt *sp. nov.*

Body 6 cm. long and 1.1 cm. wide; median portion of sole 2.2 mm. wide; mantle 2.6 cm. long. Ground colour buff-grey, covered with flesh-coloured granules; back with a slightly paler median line but no raised keel save at the extreme hinder end near the caudal pore. Shell 8.5 mm. long and 6. mm. wide, nucleus small and white, rest brownish, concentrically striate, also with some radial striae. Penis tubular, bow-shaped, 9 mm. long and 1.5 mm. in diameter; epiphallus 15 mm. long in the natural convoluted shape; upper flagellum 14 mm. long and 0.5 mm. in diameter with a recurved tip, 1.5 mm. long. Spermatheca ovoid-oblong, 9 mm. long and 4 mm. wide, with an apical, slightly curved, narrowly ovoid accessory sac, 4.5 mm. long and 2 mm. wide, duct narrow about 3 mm. long. Distance from base of spermatheca to atrium 6 mm. Oviduct with basal 2 mm. narrowly tubular and S-shaped, followed by an ovoid part, 3.5 x 2 mm., followed by a tubular portion 8 mm. long and 1.2 mm. in diameter. Hermaphrodite gland 13 x 8 mm. with a practically non-convoluted duct 3 cm long. The general shapes of the various organs can be seen from the diagram in fig. 3.

TANGANYIKA. Kilimanjaro, Marangu, in the grounds of the Kibo Hotel, leg. B. Verdcourt (type in the Coryndon Museum, Nairobi).

A. taeniatum Simroth *op. cit.* 8, t.1, f.4, t.3, f.4, (1897)

Brown or buff-coloured with marked stripes but Simroth also figures a specimen coloured like *A. pallens* with dark stripes. Body 2.2-3 cm. long. The spermatheca is pear-shaped with tip drawn out and is shortly stalked.

BELGIAN CONGO. Undussuma, leg. Stuhlmann.

Until further material has been seen from the type locality and the complete anatomy elucidated, it is probably best to consider a very similar slug which occurs round Nairobi, Kenya, as a variety of this species. It is very similar in coloration and the spermatheca is of the same type as that figured for *A. taeniatum* but is much broader. Since Simroth figures only the dilated part of the spermatheca and a little of the duct, comparisons are impossible so far as the rest of the anatomy is concerned. The Nairobi form is described below.

Brownish-grey or pale brown with darker brown lateral stripes; body about 4 cm. long. The shell is ovate, 5 mm. long and 3.5 mm. wide. The spermatheca is subglobose about 4 x 3.5 mm. with an apical tubular portion 3 mm. long and 1 mm. wide; the duct is short, 2.5 mm. long. The anatomy is figured in fig. 4.

KENYA. Kikuyu, Ndeiya, about 18 miles W. of Nairobi, leg. B. Verdcourt.

A. ornatum Pollonera in Boll. Mus. Zool. Anat. Comp. Torino 21, (543), 5 (1906); Pollonera in II Ruwenzori, 187, t.2, f.6-11 & t.5, f.5 (1909)

Body about 2.9 cm. long, pale ochraceous; head pale, mantle obscurely 4-striped with brown and with spotted margins; back somewhat rugose, carinate; keel pale, obscure in the front half; sides of body pale chestnut, irregularly and interruptedly striped, showing obscure median stripes and minute irregular spots. Sole pale. Spermatheca rounded 'two thirds the length of the duct' but from the figure it appears to be twice as long as the duct.

UGANDA. Entebbe (Abruzzi Exped.)

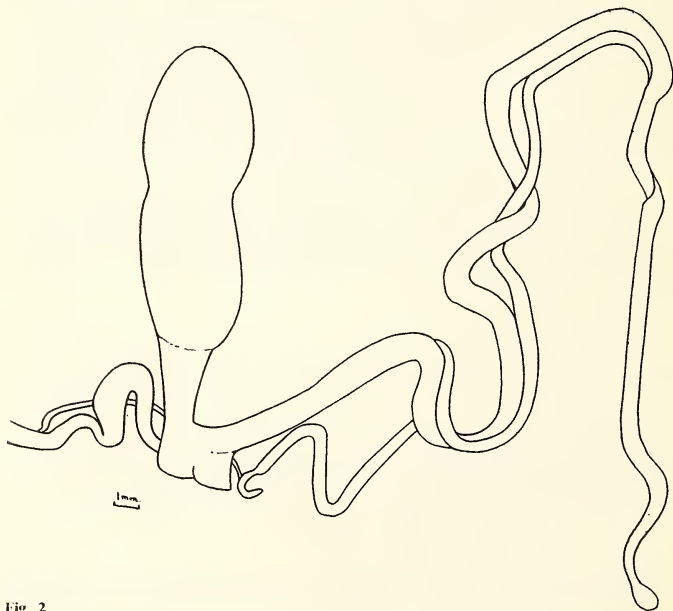


Fig. 2

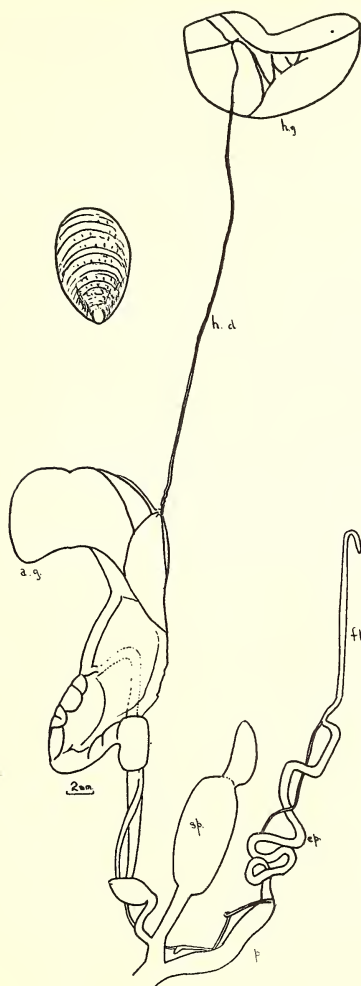


Fig. 3

A. auriantiacum Simroth in Die Nacktschnecken Ost-Afrikas 9, t.1, f.6, t.3, f.3 (1897)

Body about 3 cm. long, yellow-buff with a dense mottling of orange-brown spots, some of which are arranged to form an irregular stripe on the hind body. According to Simroth the genitalia are similar to those of *A. flavum*. The spermatheca is longer with a 'narrow tip and a long stalk'.

TANGANYIKA. W. Mpororoberge, 2000 m., SO bei Migore, leg. Stuhlmann.

A. cavallii Pollonera loc. cit. 5 (1906); Pollonera in II Ruwenzori 188, t.2, f.11, 12, & 13 and t.5, f.2 (1909)

Body about 3.3 cm. long, dirty yellowish in colour, paler in front with a distinct but pale, grey-brown stripe on each side. Mantle minutely granular with distinct zones. Back minutely granular, distinctly carinate throughout its length. Sole pale. 'Penis very big and not much longer' (sic); spermatheca round, two thirds the length of its duct.

UGANDA. Fra Kijemula e Madudu (Abruzzi Exped.)

A. variegatum Simroth op. cit. 9, t.1, f.7 (1897); Pollonera in Boll. Mus. Zool. Anat. Comp. Torino, 21 (543), 5 (1906)

Body 3.3 cm. long and 1.6 cm. wide, buff-brown with grey spots and a grey stripe running along each side of the mantle and hind body. Spermatheca spherical, half the length of the duct.

TANGANYIKA. S. Victoria Nyanza, Kome Islands, leg. Stuhlmann.

UGANDA. Fra Kijemula e Madudu (Abruzzi Exped.).

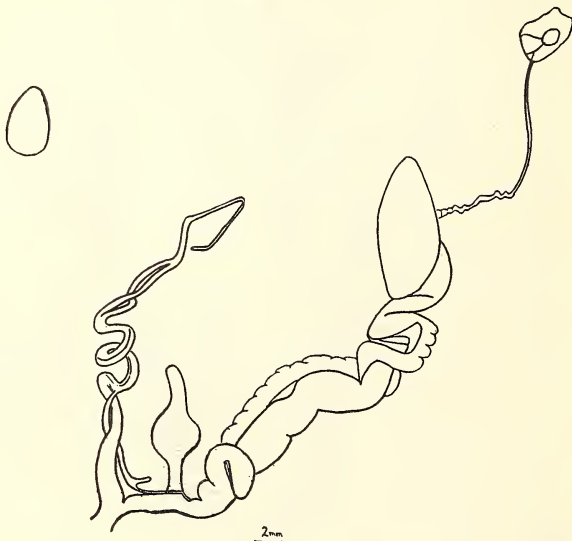


Fig. 4

A. carli Simroth in Rev. Suisse de Zool. 20, 32, t.3, f.1 (1912)

Body 2.7-4.5 cm. long, evenly grey-brown, darker towards the back, becoming darker in more mature specimens; there is a dark band running along each side of the mantle and back, also brown speckles on the sides of mantle and thin brown lines along the grooves of the back. Spermatheca ovoid-globular with a duct about 1.5 times as long.

UGANDA. Busoga, Busu, leg. Carl.

A. fülleborni Simroth in Reise in Ostafrika 1903-5 A. Voeltzkow, Wiss. Ergebn. 2, 607, t.26, f.16 and t.f. 15 (1910)

An ochraceous slug about 4 cm. long, with a single pale band on each side of the body and mantle. Spermatheca globular with duct about twice as long or longer. The inflated atrium and long vagina seem to distinguish this from any other described species.

TANGANYIKA. Langenburg (i.e. Tukuyu), leg. Fülleborn.

A. sp.

The following specimen had vestigial genitalia merely sufficient to suggest that it belongs to this genus. Body 3.5 cm. long and 0.5 cm. wide, grey with dark grey-brown stripes. Mantle 1.4 cm. long, with a dark stripe on either side and reticulation between; shell pore obvious. Hind body faintly keeled, with a dark stripe on each side and most of the longitudinal grooves dark. It may well be closely allied to the Marsabit species referred to after *A. lineatum* Simroth (q.v.)

UGANDA. Karamoja, Moroto, under bark of Acacia, leg. B. Verdcourt.

(To be continued)

CAPTIONS

Fig. 1. *Leptichnus* sp. Tanganyika, East Usambaras, Mt. Bomole near Amani, B. Verdcourt. Genitalia (inset not to scale)

Fig. 2. *Atoxon* sp. Kenya, N.E.P., Mt. Marsabit, B. Verdcourt. Genitalia in part

Fig. 3. *Atoxon kiboense* sp. nov. Tanganyika, Kilimanjaro, Marangu, B. Verdcourt. Genitalia and shell of type

Fig. 4. *Atoxon taeniatum* Simroth. Kenya, Kiambu District, Ndeiya, B. Verdcourt. Genitalia and shell

Flamingos on the Lokippi Salt Lake

The Lokippi Salt Lake, which is filled by the Suguta River, at present covers an area of about six square miles, but after the rains is very much larger. At this time of year (November) it is very shallow.

When on safari in late October I saw tens of thousands of birds on the Lake. Near Naperito Island most of them seemed to be pink Flamingos. Near the edge of the lake most of them were white birds with black legs, black near undersides to their wings, and black heads. In a few cases the white parts were slightly pink.

If these latter are young Flamingos, I suspect there may be a very large number of nests on Naperito Island, which appears to be inaccessible except by raft, and that the island may be a major breeding ground.

R. J. H. Chambers, District Officer, Samburu District

SOME INDIGENOUS COAST PLANTS FOR COAST GARDENS

By R. MORAY GRAHAM

I trust that I shall sometime see
A forester who loves a tree;
Whose soul is not immersed in slumber,
Dreaming of potential lumber.

At best gardening on the Coast can be disheartening. Too often, if the house is not perched on a bed of old coral the soil consists of pure sand. A few plants do not seem to mind this unduly, but one always feels that the next long dry spell will see them off, and that is disturbing.

Up-country people who own houses on the Coast normally inhabit them for just one or two months in the year, avoiding the rainy season, and so their efforts can only be spasmodic. Those Europeans who are more or less permanently resident are mainly businessmen living on or near Mombasa Island. Their houses, as often as not, are leased, and it is very well known that a gardener's best work is done on his own land.

It may be noted that relatively few Coast species are really worth cultivating, that fewer still are at all well known, and that almost the only way in which seeds, roots or cuttings can be obtained is to go out into the bush and collect them. And this, unless one happens to be able to get out on safari for weeks at a time, at different seasons of the year in order to spot potential winners in flower and in fruit, is nearly impossible.

Not many people have tried seriously to cultivate indigenous species in a garden on the Coast. One might ask why the Forest Department does not run an official nursery to try out far more Coast plants of promise, selling interesting types to the public. There are two possible explanations. Firstly, some probing auditor, green though his pencil may be, would want proof that *Heinsia*, for example, really does produce saleable timber, and that could lead to endless altercation. And secondly, of course, there is the odd fact that so few foresters are interested in flowers.

In practice some of the better Coast plants are already commonly used. *Adenium obesum*, with its bright pink Azalea-like flowers will do even at 6,000 feet. The local white *Plumbago zeylanica* is grown, but is not seen nearly so often as the sky-blue South African form. *Hibiscus schizopetalus* is also commonly used, and some bulbous species like *Gloriosa*, *Haemanthus* and *Crinum* have a very wide natural distribution and are found up-country. *Clitoria ternatea* is freely used on the Coast. The palm-like *Encephalartos hildebrandtii*, though sometimes seen in Nairobi, could with advantage be planted much more on the Coast. It is common in the Arabuko-Sokoke forest near Kilifi.

Palms, other than coconuts, are always worthy of a place. *Borassus flabellifer*, with that curious bulge two-thirds of the way up the stem, prefers deep soil, but grows quite well on parts of Mombasa Island. *Phoenix reclinata*, the common *mukindu*, is less exacting. *Raphia ruffia*, normally riparian, will do well enough in damp hollows. Its leaves may grow to a length of 50 feet and its fruits are those blatantly artificial-looking, highly polished 'pine-cones' sometimes found in local curio shops. The well-known gardeners' fibre is harvested from it. The Oil-palm, *Elais guineensis*, occurs, usually as a riparian plant, but is not difficult to grow if it can be watered occasionally.

On a Coast plot one does not usually ask more of a tree than that it should provide shade, yet there are some locals which are also decorative when in flower. Many

of them are deciduous during the dry weather, but are correspondingly hardy. Those which do not shed their leaves so freely demand better soil conditions as a rule.

Erythrina abyssinica, common from sea-level to 7,000 feet, is often rather scraggy looking. A far finer species, *E. saculeuxii*, is found in savanna, or as a forest tree in the Arabuko Sokoke area. When in full bloom a well-grown specimen is spectacular with its masses of brilliant scarlet flowers. *Fernandoa magnifica* from the Shimba Hills bears very large orange-coloured flowers resembling those of its relation, the Nandi Flame; but these are neither such a good colour, nor are they so freely borne as on *Spathodea*. *Markhamia zanzibarica*, again, is very similar to the Nairobi representative of the group, *M. hildebrandtii*. The flowers are yellow with purple spots.

Several of the smaller trees, growing to a height of from ten to 25 feet, are worth considering. *Mundulea sericea* has reddish-purple flowers, while those of *Millettia usaramensis* are mauve or mauve-blue. These very attractive little trees may resemble an arborescent *Wistaria* when in full bloom. A fish-poison is made from the bark of *Mundulea*, and also from that of *Barringtonia racemosa*. The large, cream-coloured flowers of this plant are borne on long pendulous racemes like those of the Sausage Tree (*Kigelia*); but as it only thrives in deep shade on a river bank it is seldom seen. Incidentally, *Kigelia aethiopica* itself is quite worth growing if one has land to spare.

Leptactinia platyphylla from the Shimba Hills has sweet-scented, white, star-shaped flowers an inch across which are freely borne in a good year. Those of *Holarrhena febrifuga* are very similar, though the tree belongs to quite a different family. *Ixora odorata*, a rather scandent little tree also from the Shimba Hills, bears heads of trumpet-shaped flowers up to two and a half inches long, pink outside and white inside, followed by small red cherry-like fruits. This is an attractive plant. From the same area comes *Turraea kaessneri*. Each of its rather striking and sweet-scented white flowers, borne in clusters, consists of a narrow central trumpet two and a half to three inches long; but in addition five greenish-white strap-shaped petals up to five inches long hang from the calyx. *T. mombassana*, a many-stemmed shrub growing to about nine feet, bears, singly, quantities of small white flowers about one and a half inches long, against a dense background of small, dark-green leaves.

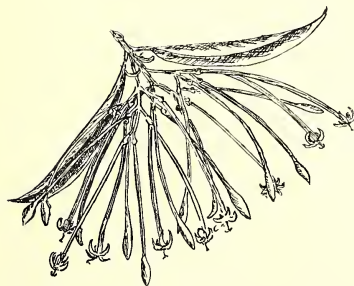


Fig. 1. *Ixora odorata*

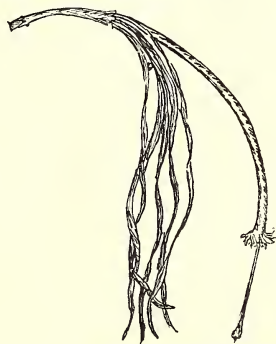


Fig. 2. *Turraea kaessneri*
Single flower

In the dry bush country north of Malindi several species of *Cassia* are common. They are small, deciduous trees with bright golden-yellow flowers, sometimes scented, borne in profusion. It is difficult to be sure of today's names for these, but *C. abbreviata*, *C. afrodistula* and *C. singueana* would all seem to be worth growing. In any event as seeds or plants cannot be bought, the names do not matter. It is enough to know that there are useful, hardy species available to those who care to look for them. And of course, with regard to names the botanists are quite unpredictable.

Lawsonia inermis is another small tree from the bush country near Malindi. It is not in itself very striking, but the numerous small, white flowers are very sweetly scented. The scent is extracted by Swahilis and Arabs and used in perfumery. In addition henna dye, taken from the leaves, is used locally for dyeing finger-nails red. Scent used to be extracted also from the flowers of a local *Uvaria*, not yet finally identified. These are two inches in diameter, greenish-white in colour with a maroon mark at the base of each petal. Another small tree of the same family, *Asteranthe asterias*, has scented, greenish-white, quite large flowers with a purplish mark at the base of each petal.

In the family of *Rubiaceae* we find *Rothmannia fischeri*, a small forest tree with large bell-shaped flowers, white with purple spots. *Gardenia lutea* and *G. volkensii* are savanna species with tubular white flowers turning yellow as they age. All of these have the typical scent of *Gardenia*. They are slow growing but interesting and hardy plants. *Heinsia crinita*, a shrub to about 12 feet, is common in the bush near Kilifi. When in flower it is perhaps the most showy and attractive of the whole group. The extremely numerous white, star-shaped flowers cover the whole plant and are jasmine-scented. Unfortunately the show lasts for three or four days only, after which all the petals are shed.



Fig. 3. *Heinsia crinita*



Fig. 4. *Capparis galeata*

Brackenridgia zanguibarica, a small tree of the Coast and of the Shimba Hills, is another potentially excellent garden species which, like its relation *Ochna*, loses much of its value because its flowering period is so restricted. The small white flowers seem to envelop the tree completely once or twice a year, but fall almost at once. The rather dull purple flowers of *Securidaca longipedunculata* on the other



Fig. 5. *Strophanthus verrucosus*

hand, though very numerous, last well on the tree. They are scented and are followed by fruits which look very like locusts. The Swahili name for the plant is *mzigi*.

Apart from those already mentioned, there are some reasonably attractive shrubs available. *Acridocarpus zanzibarius* may be found in blossom for most of the year and the flowers last well. The plant is almost too common to receive the attention it merits. Various forms of the bright red *Pentas* are already common in cultivation. The Coast one is good. It appears to be *P. bussei*. Some of the smaller white *Clerodendrums* are quite handsome, but most of them have an evil smell, which is presumably why they are used as bait in woven fish-traps.

Among the *Acanthaceae* there are several useful plants. The Coast form of *Thunbergia affinis* bears large Gloxinia-like flowers, blue when newly opened, but

turning to a good purple with a yellow throat. *Ecbolium amplexicaule* is a somewhat straggling undershrub. The delicate flowers are about an inch across and are usually greenish in colour. They may, however, be bright emerald green turning to blue-green in the throat, and are then very attractive. Several species of *Barleria* have very delicate textured flowers from one to two inches in diameter, white, sky-blue or carmine in colour. The botanists, apparently, have not yet sorted out this group.

Tetracera boiviniana, a somewhat untidy shrub from the Shimba Hills, bears white flowers an inch and a half across, and scented strongly of ripe peaches. On the forest edge near Kilifi there is a scrambling or climbing form. *Strophanthus mirabilis*, a many-stemmed shrub from the Coast bush, has bell-shaped flowers more than an inch in diameter. The corolla is white and the sepals pinkish. The petals are elongated into tails over an inch and a half long—an interesting-looking flower.

A small shrub which will grow in pure sand almost at high water mark, and which is not undecorative, is *Sophora tomentosa*. The flowers are yellow and not very conspicuous; but the whole plant, stems, leaves and seed-pods, is covered with velvety silvery-grey tomentum. Another plant which does not object to salt spray is *Capparis galeata*. This fleshy-leaved, scrambling shrub is frequently found on the low coral cliffs of the shore. The large flowers which appear to consist largely of stamens, are white when they open, but soon turn pale mauve. Very young buds pickled in salt and vinegar make an excellent substitute for capers.

A few climbing plants are worth a mention.

Strophanthus verrucosus, from Arabuko Sokoke, climbs to 30 feet or so, supporting itself by means of curious triangular, corky projections. The flowers are fairly large bells, white, yellow and maroon inside. The petals, like those of *S. mirabilis*, are produced into tails, in this case six or eight inches in length. *S. courmontii*, from the Shimba Hills, is a much larger plant. The bell-shaped flowers, two and a half inches across, are white with red and yellow stripes inside, but the petals are orthodox in shape. Even larger is *Landolphia florida*. The large, white sweet-scented flowers are jasmine-like and are followed by fruits which, externally at least, could very easily be mistaken for big, yellow lemons.

Combretum paniculatum could be described as a very large climber, or almost as a very scandent tree. The countless small, scarlet flowers are borne on the upper surface of horizontally growing branchlets. If constantly cut back, it can be treated as a large shrub, and very handsome it can be. *Vanilla roscheri*, an orchid which may climb to a height of 30 feet or so, looks like a long string of green sausages draped over the scrubby forest in which it is found, but the few flowers are very lovely. They are large and white, with five outer petals and a central trumpet, salmon-pink inside, and slightly frilled.

The seeds of *Caesalpinia bonduc*, another scrambling and spiny shrub found growing in pure sand very near the sea, are borne in attractive, canoe-shaped pods growing horizontally and opening on the upper surface only. They are roundish, about two-thirds of an inch in diameter, extremely hard when ripe and pale blue-grey in colour. They are collected locally for use as counters in the game of 'Bau'. The seeds of another small legume are somewhat unusual in that they are quite a bright blue when ripe; and there are plenty of others which could make an interesting and amusing collection for the children. A word of warning to the seed collector, however. *Mucuna pruriens*, a climber found south of Mombasa on the fringe of the mangrove swamps, bears pods from three to five inches long, in pairs. These sometimes resemble in miniature the horns of a buffalo and are covered in what looks like velvet. It consists, in fact, of minute, barbed, and probably poisoned spines which cause intense irritation if allowed to settle on the skin. This can happen if one stands under a ripe fruit and shakes the plant gently.

Most ground orchids just refuse to flower if transferred from their chosen habitat,

but it might be worth experimenting further in damp soil with two fairly common Coast species. The flowers of *Eulophia wakefieldii* are an inch across and very bright golden-yellow in colour. Those of *E. cucullata* may be nearly double this size and a lovely clear mauve-pink colour. Both grow to three feet or more in height.

Finally, *Kaempferia aethiopica*, which from a little distance could easily be mistaken for a ground orchid, bears delicate bright pink and yellow flowers two inches in diameter, on stems from six to 15 inches in height. It prefers some shade and fairly moist conditions, but given that, it does not object to being transplanted, and is very well worth growing.

Tastes differ, and there are doubtless scores more species as colourful or as interesting as those mentioned; but it will be very many years before more than a fraction of them are given a trial run. Here are enough for a sample plot.



Fig. 6. *Vanilla roscheri*

ADAPTIVE COLORATION IN MAMMALS ASSOCIATED WITH THE SODA FLATS OF LAKE MAGADI

By MALCOLM J. COE

Biology Department, Royal Technical College of East Africa

Lake Magadi is a soda lake situated in the floor of the Rift Valley, some 70 miles south-west of Nairobi. The surface of the lake bears a thick crystallised layer of trona, which is dredged commercially by the Magadi Soda Company, Limited. At the southern end of the lake there are extensive soda flats derived from a series of lagoons which are fed by hot springs. The soda flats and associated pools of brackish water, rich in micro-organisms, algae and fish, attract numerous birds and mammals, many of which live permanently in the area.

Commonly seen on the flats are Wildebeeste and Zebra, with the occasional group of Wart Hog that come to drink at brackish pools in the vicinity. All these three mammals are of an unusually uniform pale coloration. The occurrence of pale colour forms is by no means uncommon in other parts of the world. A pale coloured race of the common House Mouse (*Mus musculus*), was described on a small island in Dublin Bay. The mice were found by ¹Jameson (1898), living on sand dunes on the island. As the island had only been in existence for a hundred years he proposed the reasonable hypothesis that this race had been produced within the stated period. This rapid evolution would have been hastened by the active predation of individuals lacking light protective coloration.

The formation of local races of mammals due to environmental factors is not a new idea. Pale forms have been described in arid areas of Africa and America on many occasions. Conversely dark forms have been associated with dark lava soils. The factors operating in such changes are many and involved. ²Cott (1951) noted that many authorities hold the view that pale coloration is associated with arid conditions and low humidity.

Observations at Lake Magadi suggest that in this case a new factor must be considered. The young of many mammals are of a different colour from that of their parents. Burrow dwellers require little in the way of camouflage in their early life and bold patterns are of no disadvantage to the survival of the species. Young Wart Hogs, with their conspicuous pattern, are too well protected by the parents for it to be disadvantageous to their survival ³(Mitchell 1912). Among the mammals of Lake Magadi we find that this disparity of colour between young and adult has been almost completely eliminated. Both Wildebeeste and Wart Hog bear a uniform sandy colour in both mature and immature animals, while Zebra maintain in adult life a colour very close to the brownish striped pattern of young animals. This uniformity of pattern may be explained in terms of their habitat, which is essentially barren and open, offering little in the way of shelter. In addition the almost continuous heat haze makes a sandy hue almost invisible at close range, and any slight difference in colour between immature and mature animals would be accentuated in such an atmosphere. It is interesting to note that nocturnal mammals, such as Hyena, Jackal, and Wild Cat are all normally coloured, and do not show any of the colour changes associated with diurnal mammals.

¹Jameson, H. L. 1898: On a Probable Case of Protective Coloration in the House Mouse (*Mus musculus* Linn.). Journ. Linn. Soc., Zool., XXVI, pp. 465-73, 1 Pl.

²Cott, H. B. 1951: Adaptive Coloration in Animals. Methuen.

³Mitchell, P. Chalmers, 1912; The Childhood of Animals. London. pp. XIV + 269, 12 Pls., 36 figs.

Colour change would seem in this and other cases to be closely connected with physical factors of the environment, but the high humidity obtaining on the soda flats due to heat and evaporation does not support the view that pale coloration at Lake Magadi is a response to either arid conditions or low humidity.

The most obvious peculiarity of the Magadi habitat is the high mineral content of water consumed by mammals in the area. In addition, as vegetation here grows on a highly mineralised substrate, mammals will, during feeding, consume large quantities of these salts. If the consumption of large quantities of these substances by herbivores manifests itself in a metabolic effect that tends to reduce or prevent pigment formation, a pale form of the mammal concerned will result. Under such conditions it would only remain for the selective advantages of such a colour to be concentrated by the action of predators on the more conspicuous forms, to produce a new race.

These observations are preliminary in their scope, and it would be interesting to see if other vertebrates at Magadi are affected in the same way. Are carnivores feeding on Magadi herbivores also pale in colour?

LETTERS TO THE EDITOR

Dear Madam,

Call of Secretary Birds

My husband and I have been most intrigued for weeks by noises we have heard during the night and have just discovered they are made by Secretary Birds. There are four that live around the field at the back of the house and roost every night in the *Cupressus macrocarpa* trees.

We thought at first it might have been puppies, jackal or a reed-buck. It is the most extraordinary mewing and until yesterday we have only heard it during the night. In the daytime they make a totally different noise. My husband says it is like a Boran bull and I think it is more like a bull-frog—you would never think it could be made by a bird!

In the East African bird book by Praed and Grant I see that Captain Priest describes the call as a 'triple reedy clarinet-like note made while the bird is on the wing'. There are far more than three notes during the night: five or six short mews followed by a longer one.

Yesterday morning there were three notes, but the birds were on the ground, with one perched in a tree. The daytime croak is always made when they are on the ground or perched in a tree.

Yours, etc.,
MARY HENDRY,
Ol Kalou

Dear Madam,

Crested Francolin

On the 19th February, 1959, an adult specimen of the Crested Francolin (*Francoelinus sephaena* (Smith)) was obtained near Pakuba on the Albert Nile, Murchison Falls National Park, Uganda.

This species occurs locally in small numbers in dense riverside bush in the Pakuba and Buligi areas along the east (Acholi) bank of the Albert Nile and the north (Acholi) bank of the Victoria Nile. I have also seen it at Entoroko, Toro, on the south-eastern shore of Lake Albert.

It is readily indentifiable in the field: the small size, light streaks on the flanks, jaunty 'bantam' tail and carriage, and the small, dark crest are distinctive features.

In the Murchison Falls National Park they have been seen in pairs and small coveys up to five in number. They take little notice of cars, but retire into the cover of dense bush when approached on foot. If pursued they fly swiftly for a short distance to another patch of cover.

Yours, etc.,

J. M. SAVIDGE,

Warden, Murchison Falls National
Parks

Dear Madam,

Two Variations of Animals

I have recently, while on safari, noticed two variations of animals that might interest you.

On the top of the escarpment above the south-eastern shore of Lake Rudolf I saw a profusion of Hares (?) that had ears about two inches longer than their neighbours a hundred miles to the south.

On the north-western corner of the Aberdares I saw an animal that appeared to be a Badger with dark-brown markings in lieu of the usual white markings.

As a matter of minor extra interest I have just caught a large male baboon in the act of eating a baby dik-dik.

Yours, etc.,

ANTHONY DYER,

White Hunters (Africa) Ltd.,
On Safari

Mr. J. D. L. Fleetwood, Mammalogist at the Coryndon Museum, Nairobi, has kindly supplied us with the following footnote concerning this letter:-

1. The hares were undoubtedly *Lepus raineyi*, Heller. This species occurs over the area north of Mount Kenya, from the Northern Guaso Nyiro to Marsabit. In the field it is identified from the Common East African Hare, *Lepus capensis*, by its longer ears and greyish patch on the rump.
 2. The normal white or grey coloration of the Ratel, *Mellivora capensis*, is sometimes deeply stained by earth.
(Vide 'The Ratel', E.A. Nat. Hist. Soc. Jour. Vol XXIII No. 2 (99)—June 1958.).
 3. The Baboon often kills and eats the young of mammals. It frequently takes young domestic goats, which may be considered a point in its favour, considering the present goat population.
-

ACTIVITIES OF THE SOCIETY IN NAIROBI

June to December, 1959

Sunday rambles are still an active part of the Society's programme and have continued throughout the second half of 1959. Unfortunately the attendance at some of these excursions has been rather poor.

The first excursion during this period took us to the Narok-Ngong circular route. Unfortunately the country was drier than usual in June, which meant rather less wild life than was hoped. A number of birds of prey were sighted, however, as well as scrub-loving birds, such as scrub-robins, barbets and not less than three species of woodpeckers and several species of starlings. On the way home a few giraffe in a big herd aroused quite a discussion as to whether they were the Reticulated species or not and a small solifuge was studied closely but respectfully. This trip was commemorated by a front-page picture in the *East African Standard* the following week, with two of our ladies admiring the view over the Rift Valley.

In July a very depleted party (holiday season?) visited Mr. Cole's estate at Elmenteita and watched wild fowl. Hot springs in the area provided an additional interest.

A Saturday afternoon ramble in August to Amner Estate in Kiambu proved a great success, and it is hoped that similar excursions can be organised again.

During this period, as during the first half of the year, the main interest has been bird-watching. We still endeavour to keep up the botanical aspects, but since Mr. R. W. Rayner had to leave the country last year on account of illness, it seems difficult to get a really keen leader in this field. An otherwise most enjoyable excursion to Ol Donyo Sabuk in August suffered from this lack of a good botanist; the tropical rain-forest on that mountain is a worthy ground for botanists.

Still there is no reason for despair. On the Sunday ramble in September to the Chania River, near Gakoi Forest Station, a small party of botanists found some very interesting orchids and we all spent some extremely pleasant hours among the streams of the Kikuyu Reserve.

For the only weekend excursion, Lake Magadi was chosen, which naturally meant more bird-watching, since the country there is almost arid at this time of the year. But what a paradise for bird-watchers! Only a very small party shared the sights there, but we certainly all enjoyed it. Everything was absolutely ideal, including the weather, which kept slightly overcast and was therefore not uncomfortably hot. At the southern end of the lake, near the hot springs, a most impressive congregation of Lesser and Greater Flamingo, White and Pink-backed Pelicans, Marabou and Spoon-billed Storks, as well as Wood Ibis, could be seen mixed with Gull-billed Terns, Black-winged Stilts, Avocets and Stints. Marsh and Curlew Sandpipers and of course the Chestnut-banded Sand-plover (the Magadi Plover), were running about happily in great numbers among Greenshanks and Ruffs. We also found time to look at the Tilapia of Lake Magadi swimming in the warm water.

For November a visit to Lake Naivasha was arranged and in December members will visit the fish hatchery at Sagana with Dr. V. D. van Someren.

We still try to maintain our programme of monthly lectures on subjects of natural history interest, but in two instances these lectures have had to be cancelled at the last moment, due to unforeseen circumstances. In August Mr. Malcolm Coe lectured on Bats, a subject of special interest in East Africa at this time, which was followed by a stimulating discussion on breeding and behaviour. Dr. Vernon van Someren's

lecture in October, entitled 'A Bird Watcher's Year', which was illustrated by his superb bird photographs, left us with the hope that he will come back later with still more of them. It would, perhaps, be a good idea to make a yearly feature of showing members' colour slides.

In November Mr. John Williams started a new series of lectures concerning recent acquisitions to the Coryndon Museum. This time he talked about birds, and besides some most interesting recent accessions from Africa, showed us a most wonderful collection of paradise birds from New Guinea. He also showed a number of East African birds which are difficult to identify. In December Mr. T. T. Bestow has promised to give us a lecture illustrated with colour slides on the Northern Frontier.

E.W.

The Recognition of Temminck's Stint in the Field

Temminck's Stint (*Calidris temminckii*) is an uncommon winter visitor to Kenya in small numbers. It is most frequent at Ferguson's Gulf on the western shores of Lake Rudolf: it also occurs spasmodically on Lakes Naivasha, Nakuru, Elmenteita, Baringo and Magadi, and on dams on the Kinangop plateau. In spite of the small number of published records for this species in the Colony, it is probable that Temminck's Stint is commoner than these suggest. The difficulty of identifying the species in the field militates against frequent sight records.

On the 7th November, 1959, I had the good fortune to have a solitary Little Stint (*Calidris minuta*) and a single Temminck's Stint under observation at extremely close quarters on Crescent Island, Lake Naivasha. I was able to make notes on their field appearances which may be of use to others in distinguishing these two birds.

In the bird books stress is laid on the character that Temminck's Stint has white outer tail feathers, the Little Stint grey. This is a good character when the bird flies away from the observer, but from other angles it is not always reliable: pale grey can look very white in some lights.

The two field characters which impressed me while watching the two birds side by side were, firstly, Temminck's Stint looked and behaved just like a diminutive Common Sandpiper, while the Little Stint was to all intents a miniature Dunlin. Secondly, the plumage of the upperparts of Temminck's Stint was *dark grey and completely uniform*: the Little Stint had *pale grey* upperparts with blackish bases to the feathers, giving a *distinct mottled or spotted* appearance.

Other Temminck's Stint field characters included yellowish-olive legs and feet (black in Little Stint) and a complete greyish band across the chest. In the Little Stint there is a grey patch on each side of the chest, not a complete band. It was found, however, that these two characters were of value only at very close quarters through binoculars.

John G. Williams, Coryndon Museum, Nairobi.

BOOK REVIEW

The Mystery of the Flamingos

By Leslie Brown

Country Life Ltd., London. 115 pages. 32 plates and coloured frontispiece from Mr. Brown's photographs. Date of publication, end of 1959. Anticipated Nairobi price, Shs. 25-30.

Many of the most exciting stories in literature are concerned with discovery in one form or another, and in the annals of ornithological discovery this book will, I am sure, rate high. It is a book of real adventure: the flamingos did indeed turn out to be birds of mystery, as the title implies, and the investigation developed into as fascinating a quest as any naturalist could dream of. As the pages unfold, Mr. Brown relates his story with skill—writing simply, humanly and with clarity. The beauty or grotesqueness of the flamingos' fascinating and little-known displays, the appalling grimness of certain of their chosen surroundings, the profound problems of population, longevity and movements, a gripping narrative of the Natron breeding quarters and a nightmare foot-excursion which nearly killed him—all hold the reader's attention all the time.

The book is concerned with the two species of flamingo found in Africa—the Greater (*Phoenicopterus ruber*) and the Lesser (*Phoeniconaias minor*). Odd to relate, when Mr. Brown began his investigations in 1951, surprisingly little was known about either species. For instance, there was no published record proving that the Greater had bred anywhere in Africa south of the Sahara, while the few breeding records for the Lesser were tenuous and vague. During the years 1951-9 Mr. Brown obtained excellent records of the breeding of both species and cleared up many other points in their life cycles, and what makes the achievement all the more remarkable is the fact that everything had to be done during the strictly limited spare time in a busy official life.

Quite early he decided that the only practicable method of studying the general movements and distribution of these birds was by covering the Rift Valley lakes in a light aeroplane, and for this purpose he actually learned to fly himself, which was (he explains) cheaper and nicer than hiring! It was from the air that he first discovered the huge breeding colonies of the Lesser—till then unknown—on Lake Natron, and except for air reconnaissance it is probable that they would have remained unknown, since they are too far from the shores to be clearly visible.

Lake Natron, it appears, is the only regular breeding ground of the Lesser discovered to date. In 1954 Mr. Brown estimated that 100,000-150,000 pairs were breeding here. That year he made a solitary attempt to walk out over the mud to visit one of these colonies, but the mud beat him and he felt lucky to escape alive, creeping back to shore in an exhausted condition with his feet terribly burned by the soda. There seemed to be little breeding in 1955-6, but 1957 was a tremendous year with an estimated total of nearly 600,000 pairs. Now he again attempted to reach nests on foot—this time with his admirable Mkamba helper, Njeru—and succeeded. These nests were of the orthodox mud-platform type.

Regarding the breeding of the Greater, Mr. Brown received the surprise of his life when he discovered some 5,000 pairs nesting at the end of 1956 on islets in Lake Elmenteita! The remarkable feature here was the fact that no mud was available on these islets and that the birds therefore made no attempt to construct orthodox nests, but merely used scrapes in the ground with a little lining! Unfortunately this colony was broken up by the depredations of a few Marabou Storks, but contrary to all precedent the Greaters nested here again in mid-1957 and in considerably larger numbers—over 9,000 pairs. Mr. Brown obtained excellent observations and photographs of these from a floating hide of ingenious and original design. A rather larger colony also nested on Natron.

In addition to his notes on breeding, Mr. Brown discusses a number of other topics which I can barely touch upon here. For instance, there may be six million flamingos in the world, of which over half live in East Africa (Lesser, three million; Greater, 20-50,000). There is cause to think that these birds live for a good many years and have very few natural enemies: hence, without some form of control, they might well tend to over-populate their environment, so perhaps the control is in the form of considerable irregularity in breeding?

Although the book is short it tells the story fully and there is a valuable appendix. The plates illustrate the text well and there are two good maps. Mr. Brown has already published two previous books—*Birds and I* (1947) and *Eagles* (1955). This, his third, maintains his high standard and cannot be too strongly commended.

Myles E. W. North

OBITUARY

ALEXANDER JOHN WILEY

It is with the deepest regret we again record in these pages the passing of another member of this Society, Alex Wiley of Kabete. He had been a member for many years, and at the time of his death, at the age of only 42, on the 17th September, 1959, was also a serving member of our Committee.

Alex was the only son of one of Kenya's early coffee pioneers, Mr. Tom Wiley of Ruiru, and after early schooling in England and later at St. Aidan's, Grahamstown, South Africa, he returned to Kenya in 1936 to a post in the Veterinary Laboratory at Kabete. He had intended to train as a Veterinary Surgeon, and had indeed started his University career in London in 1945, when ill-health forced him to give up his studies and return to Kenya, where he again resumed duty at Kabete, filling with distinction in latter years the post of Zoologist in the Zoological and Tsetse Research Section. His reputation as an authority on African ticks was known far beyond the borders of Kenya, and his scientific research on these, and latterly on helminthology, was distinguished by a meticulous and painstaking ability.

But there was scarcely a branch of natural history in which Alex was not also deeply interested, and in his methodical fashion he first studied and became widely known for his interest in butterflies, publishing a paper on these with Mr. J. Hudson in this Journal, which has guided the first steps of many Kenya boys in this fascinating study since then. He even amassed a valuable collection of natural history stamps, and botanical subjects, particularly poisonous plants, were of great interest to him. Latterly he took up the study of African cowries, of which his collection soon became known widely overseas, and on which his field notes and observations were outstanding for their accuracy and detail.

Birds were perhaps his deepest love, and of these his field knowledge was most extensive. He was in addition a photographer of considerable skill, his still pictures and films of birds and other natural history subjects being of most delightful quality.

To Alex, Kenya was home, and his quiet, unassuming, but firm personality will be missed by all, not least by our Committee to whose deliberations he contributed much sound wisdom in his short period of service. On the personal side, his cheerful, steady friendship will not be easily replaced; and to his widow Mary, and their three children who shared his love of nature, we extend our deepest sympathy in their loss.

V. D. v S.

EAST AFRICA NATURAL HISTORY SOCIETY

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Contributions. The Committee is pleased to consider contributions on natural history for publication in the Journal on the understanding that these are not also being offered, wholly or partially, to any other journal. They should be addressed to the Secretary, P.O. Box 4486, Nairobi.

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Nomenclature. Where a recent standard work for the area is available (e.g. Praed and Grant for birds) the names given there (both English and scientific) should be used. Initial capitals should be used for specific English names, e.g. Pied Wagtail and small initial letters for group names, e.g. wagtails. Scientific names must be underlined. Where an English name is used, it is normally advisable, on first mention, to add the scientific name to avoid misunderstanding.

References. These are usually abbreviated in the text and listed more fully in alphabetical order of authors at the end of the article. For example, in the text a book reference might be (Jackson 1938: I p. 24); a periodical reference might be (Pinhey 1956: p. 20). At the end of the contribution: Jackson, F. J., 1938. *Birds of Kenya and Uganda*. Pinhey, E. C. G., 1956. *The Emperor Moths of Eastern Africa*. Journ. E.A. Nat. Hist. Soc. XXIII No. 1 (98). With short articles it may not be worth making a list of references at the end, but the whole reference in the most abbreviated comprehensible form should then be inserted in the text.

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